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## PATENT SPECIFICATION

556,045



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### PROVISIONAL SPECIFICATION

#### Improvements in or relating to Felted Material

I, FREDERICK WILLIAM PETER TAYLOR, of The Taylor-Schrader Company, 132, Lots Road, London, S.W.10, a British Subject, do hereby declare the nature of this invention to be as follows:—

The present invention relates to felted material and, more particularly, to a material of this type for use where a high degree of thermal insulation is required and where also the weight of the material is required to be relatively low.

The insulating qualities of kapok fibre are well-known and attempts have been made to felt them, but in each case it has been found that many difficulties arise due mainly to the characteristics of the fibre and particularly to the smoothness of its outer surface. It has been found difficult to obtain any satisfactory cohesion of the fibres such as is found for instance with wool. From attempts that have been made to felt kapok fibres it was found that the result had no practical value as the fibres could not be sufficiently felted together to obtain a product of sufficient cohesion and sufficient tensile strength for practical purposes.

An object of the present invention is to produce a felted material containing kapok fibres and exhibiting high thermal and sound insulation properties and having a high flotation value, not usually found in wool and hair felt. Another object of the present invention is to provide a felted material which in addition to the above desirable properties characteristic of kapok fibre has a satisfactory tensile strength and resistance to collapse on flexing, properties which kapok fibre does not possess, and a higher resistance to attack by moth than

ordinary wool or hair felt. A further object of the invention is to provide such a felted material which is also flame-proof.

According to the present invention a felted material comprises a mixture of kapok fibre and other fibres of natural or artificial origin.

Preferably the material contains at least 50 per cent. of kapok fibre, the balance of its contents being made up of wool, cotton or artificial fibres either alone or in admixture.

Conveniently, when artificial filaments or fibres are employed it is preferred to employ hollow filaments or fibres, since these fibres in admixture with kapok fibres yield a product which has a high thermal insulation value.

By mixing wool, cotton or artificial fibres with kapok it has been found that the felting operation is greatly facilitated and a highly satisfactory product is obtained which can not only be employed for purposes which kapok fibres alone, either in loose form or in laps of loose fibre sewn at intervals, have heretofore been employed, but which can be employed with greater practical advantage in the place of loose kapok fibres or sewn lapped kapok or ordinary wool or hair felt.

When artificial fibres are employed these may be hollow with consequential improvements in the thermal efficiency of the product and an increased flotation value over a product containing solid fibres.

Whilst the range of proportions in which kapok can be mixed with other fibres varies considerably according to

the individual characteristics of the felted material such as, for example, staple length, and the well known felting properties of wool, it has been found that  
 5 when the constituents consist of kapok, wool and cotton a highly desirable product is obtained by felting in accordance with known practice a fibrous mixture of 60 per cent. kapok fibres, 25 per cent.  
 10 wool fibres, and 15 per cent. cotton fibres.

A felted product containing this mixture is found to have highly desirable qualities in that it has a closely bonded texture and a density which can be  
 15 altered at will over a wide range, and has a greater thermal efficiency and greater sound insulation properties and a higher flotation value and a greater resistance to moth attack than felt made of wool or  
 20 hair, and such a product can be flameproofed by known method in the course of manufacture. If the product of this invention is to be exposed to the danger of fire the felt may be flameproofed  
 25 without any deterioration in its other desirable properties.

In addition to the suitability of the product of the present invention for use as linings in flying and other clothing for cold climates and where kapok alone and  
 30 other insulating materials have previously been employed the product may also be substituted with great advantage, for example, for materials at present used for insulating fuselages of aircraft,  
 35 refrigerators, and other enclosed spaces and for many other purposes where a high degree of heat and sound insulation or either or both of them is required since the characteristic properties of the  
 40 product are such as to give thermal and sound insulating properties in excess of those possessed by ordinary hair or wool felt or other textile material, heretofore employed for these purposes.  
 45

Dated the 12th day of March, 1942.

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## COMPLETE SPECIFICATION

### Improvements in or relating to Felted Material

I, FREDERICK WILLIAM PETER TAYLOR, of The Taylor-Schrader Company, 132, Lots Road, London, S.W.10, a British  
 50 Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to felted  
 55 material and more particularly to a material of this type for use where a high degree of thermal insulation is required and where also the weight of the material is required to be relatively low.

The insulating qualities of kapok fibre  
 60 are well known and attempts have been made to felt it to obtain a felt having the same characteristic qualities. It has been found that when felting kapok fibre  
 65 many difficulties arise which are due primarily to the physical characteristics of the fibre and particularly to the smoothness of the outer surface. Arising from this the cohesion between the fibres  
 70 which is particularly desirable when felting has been found to be very low and compares unfavourably with such vegetable fibres as wool. From these attempts to felt kapok it was found that  
 75 the resulting product had no practical value as the fibres could not be sufficiently felted together to obtain a product of

sufficient cohesion and sufficient tensile strength for practical purposes.

An object of the present invention is  
 80 to produce a felted material containing kapok fibres and exhibiting high thermal and sound insulation properties and in addition having a high flotation value, as compared with wool and hair felt.  
 85

Another object of the present invention is to provide a felted material which in addition to the above desirable properties characteristic of kapok fibre has a satisfactory tensile strength and resistance to  
 90 collapse on flexing as compared to wool and hair felt and a higher resistance to attack by moth than wool and hair felt.

A further object of the invention is to provide such a felted material which also  
 95 is flame-proof.

According to the present invention a felted material comprises a mixture of kapok fibre and other fibres of natural or artificial origin, wherein the material  
 100 contains 40—60 per cent. by weight of kapok fibre, the balance of its content being made up of wool, cotton or other vegetable fibre or artificial fibre, either alone or in admixture. When artificial  
 105 filaments or fibres are employed it is advantageous to employ hollow filaments or fibres since these in admixture with kapok fibre yield a product which has a

thermal insulation value and an increased flotation value over a product containing solid fibres in the place of the hollow fibres. Whilst the range of proportion in which kapok can be mixed with other fibre may be varied within the above limits according to the individual characteristics of the fibres employed, such as for example staple length and the well-known felting properties of wool it has been found that when the constituents consist of kapok, wool and cotton a highly desirable product is obtained by felting a fibrous mixture of 60 per cent. kapok fibre, 25 per cent. wool fibre, and 15 per cent. cotton fibre.

The resulting product is found to have a closely bonded texture and a density which can be altered at will over a wide range and has a greater thermal efficiency, greater sound insulation properties, a higher flotation value, and a greater resistance to moth attack than felt made of wool or hair and can be flame-proofed by known methods in the course of manufacture.

In addition to the suitability of the product of the present invention for use as linings in flying and other clothing and where kapok alone and other insulating materials have previously been employed the product of the present invention may be used with advantages over existing materials for insulating fuselages of aircraft, refrigerators, rooms and other enclosed spaces and for many other purposes where a high degree of heat and sound insulation is required since the characteristic properties of the product are such as to give thermal and sound insulating properties in excess of those possessed by ordinary hair or wool felt or other textile material heretofore employed and comparable with that of kapok. At the same time the product lacks the low tensile strength and tendency to collapse, characteristic of previous attempts to produce a felted kapok.

By introducing a quantity of wool, cotton or other vegetable fibre or artificial fibre into the kapok the felting operation is greatly facilitated and the ordinary cotton or woollen carding system may be employed. However, when employing the ordinary carding system it has been found that the speeds of the main cylinder and the workers on the woollen card have to be adjusted with great care otherwise there is a tendency for the air currents created to separate the kapok from the other fibres. Most of the difficulties encountered may, it has been found, be eliminated by employing saw tooth card wire instead of the ordinary

fillet card clothing and the accompanying drawing shows in Figure 1 and 2 a side elevation and cross-section respectively of a metallic wire suitable for use for the present invention. The metallic wire comprises a thickened base 1 for incorporating into the card clothing base and teeth 2 which replace the wires employed heretofore on carding engines. The use of this clothing permits the carding of kapok fibre in admixture with other fibres without the use of a fancy roll and permits speeds which avoid air currents strong enough to separate the kapok from the other fibres. It has further been found that the batt coming from the carding engine may with advantage be rolled in paper to be carried to the next point of processing; the subsequent hardening process is conventional and thereafter the resulting felt may be subjected to any desirable treatment to suit it for the purpose for which it is to be used and, for example, may be fireproofed or waterproofed in accordance with known practice.

The resulting product may with advantage be used for purposes for which kapok fibres alone either in loose form or in laps of loose fibre sewn at intervals have hitherto been employed and may also replace ordinary wool or hair felt.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A felted material having high thermal and sound insulation properties and a high flotation value, said material comprising a mixture of kapok fibre and other fibres of natural or artificial origin and wherein the kapok fibre constitutes from 40 to 60 per cent. by weight of the material.

2. A felted material as claimed in claim 1 and having a composition of 60 per cent. kapok fibre, 25 per cent. wool fibre and 15 per cent. cotton fibre.

3. A felted material as claimed in any of the preceding claims which is fireproof and/or flameproof.

4. A process for producing the felted material claimed in any of the preceding claims which includes the step of carding the said mixtures by means of a card clothing on at least the main cylinder which card clothing is formed from metallic wire having saw teeth cut therein and applied to a flexible base.

5. A process for carding mixtures of fibres as claimed in claim 4 wherein the said teeth are substituted for the ordinary fillet card clothing on a woollen card and a fancy roll is not employed.

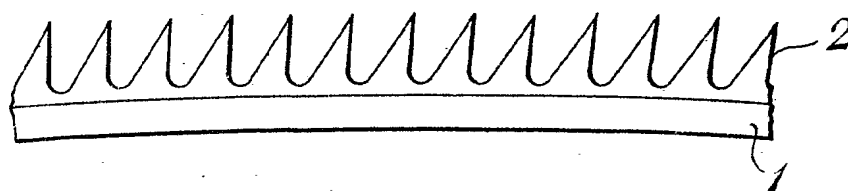
6. A process as claimed in claim 4 or claim 5 which includes the step of rolling the batt coming from the carding engine in paper prior to the next processing step.

5 7. Carded products whenever prepared by means of the processes claimed in any of claims 4, 5 or 6.

Dated the 12th day of April, 1943.

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*FIG. 1.**FIG. 2.*

*[This Drawing is a reproduction of the Original on a reduced scale.]*